Detection of defects in bridges using joint shear wave technique: A laboratory study for structural health monitoring

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This paper reports on a study carried out regarding the performance of bridges. The applicability of a non-destructive testing instrument called MIRA which uses the powerful joint shear wave principle is demonstrated by working on laboratory test specimens. MIRA gives a superior performance as compared to other non-destructive testing instruments (such as ground penetrating radar) especially for concrete structures. The results obtained are recorded, with an explanation of how this instrument will help in discovering defects in bridge structures. A concrete box beam and a column were taken as test specimens in this study.

Introduction

Many of the pre-stressed concrete (PSC) bridges, after their construction, are susceptible to corrosion, cracks and voids due the extreme weather and loading conditions. It is necessary to evaluate the performance of such bridges and then to rehabilitate them. Figure 1 shows a typical PSC box girder bridge. The levels of protection of the post-tensioning system in the bridge should appear to be in line with the current practice. Three current post tensioning tendon protection levels are: 1) a duct with grout providing durable corrosion protection 2) a watertight, impermeable envelop providing a leak tight barrier and 3) integrity of tendon or encapsulation to be inspectable or monitorable. Recent efforts to enhance the durability of post-tensioned bridges effectively have led to focused inspection procedures. It is necessary to develop an intensive maintenance/inspection plan for such bridges. The present work reports on a detailed investigation of the specimens available in the lab using joint shear wave analysis with the non-destructive testing instrument MIRA. The non-destructive joint shear wave analysis is capable of investigating a number of quality control issues such as injection quality of the cable duct (cable ducts are injected with grouting materials and injection quality depends upon the injection speed and

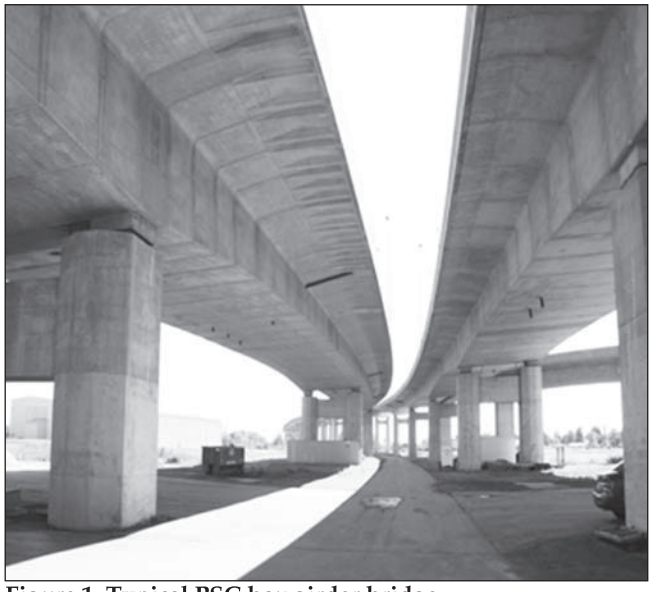

Figure 1. Typical PSC box girder bridge